DRAFT ENVIRONMENTAL RESTORATION
RFCA STANDARD OPERATING PROTOCOL
FOR ROUTINE SOIL REMEDIATION
FY02 NOTIFICATION #02-09
IHSS GROUP 900-11
IHSS 112 – 903 PAD

August 2002

1/30

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ACRONYMS

AL	action level
ALARA	as low as reasonable achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BMP	best management practice
BZ	Buffer Zone
BZSAP	Buffer Zone Sampling and Analysis Plan
CCR	Code of Colorado Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHWA	Colorado Hazardous Waste Act
COC	contaminant of concern
cy	cubic yard
D&D	Decontamination and Decommissioning
ER	Environmental Restoration
ER RSOP	Environmental Restoration RSOP for Routine Soil Remediation
FY	Fiscal Year
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IMP	Integrated Monitoring Plan
K-H	Kaiser-Hill Company, L L C
LDR	Land Disposal Restriction
LLMW	low-level mixed waste
LLW	low-level waste
PAC	Potential Area of Concern
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PCOC	potential contaminant of concern
POC	Point of Compliance
POE	Point of Evaluation
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RSOP	RFCA Standard Operating Protocol
SOR	sum of ratios
SVOC	semivolatile organic compound
ug/kg	microgram per kilogram
VOC	volatile organic compound

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1.0 INTRODUCTION

This Environmental Restoration (ER) Rocky Flats Cleanup Agreement (RFCA) (DOE et al, 1996) Standard Operating Protocol (RSOP) for Routine Soil Remediation (ER RSOP) (DOE 2002a) Fiscal Year (FY) 02 Notification includes the notification to remediate Individual Hazardous Substance Sites (IHSSs) and Potential Areas of Concern (PACs) at the Rocky Flats Environmental Technology Site (RFETS) Buffer Zone (BZ) during FY02 Activities specified in the ER RSOP are not reiterated here, however, deviations from the ER RSOP are included where appropriate

The purpose of this Notification is to invoke the ER RSOP for surface and near surface soil with radionuclide contamination at IHSS Group 900-11, IHSS 112 - 903 Pad Volatile organic compounds (VOCs) present in subsurface soil in the 903 Pad Area will be addressed through the 903 Lip Area Interim Measure/Interim Remedial Action (IM/IRA) It is not anticipated that significant concentrations of VOCs will be encountered with the radionuclide-contaminated soil

Potential threats to human health and the environment were evaluated using a screening-level risk assessment in accordance with RFCA Attachment 4 (DOE et al 1996) to determine potential human health and environmental risks posed by release sites The results of this evaluation indicate certain risks to human health and the environment exist, and that accelerated actions, in accordance with the ER RSOP, may be warranted at these release sites

Based on analytical data, contaminants of concern (COCs) in native soil at IHSS Group 900-11, IHSS 112 – 903 Pad include radionuclides (plutonium ranging from background to 152,000 picocuries per gram [pCi/g] and americium ranging from background to 31,670 pCi/g) and VOCs (ranging from nondetect to 6,100 micrograms per kilogram [ug/kg]) (DOE 2000a) indicating that an accelerated action under the ER RSOP at IHSS 112 – 903 Pad is warranted

2.0 IHSS GROUP 900-11

IHSS Group 900-11 includes IHSS 112 – 903 Pad Its location is shown on Figure 1

2.1 Contaminants of Concern

COCs at IHSS 112 – 903 Pad were determined based on data collected during previous studies (DOE 1992-2001, DOE 2000a, DOE 2001a) Radionuclides are present in the surface and near surface soil at IHSS 112 – 903 Pad VOCs are present in the subsurface soil, generally below 3 feet of depth VOCs are not a COC for this accelerated action, however, if encountered will be evaluated for potential removal

Figures 2, 3, and 4 present existing surface and subsurface radionuclide analytical results above background plus two standard deviations for existing surface and subsurface soil for Native Soil Horizons 1 (approximately the first 6 inches of native soil beneath the

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asphalt and artificial fill), 2 (native soil approximately 6 to 12 inches in depth beneath the asphalt and artificial fill), and 3 (native soil approximately 12 to 18 inches in depth beneath the asphalt and artificial fill), respectively Figures 5, 6, and 7 present the RFCA Tier I and Tier II radionuclide sum of ratios (SORs) for Native Soil Horizons 1, 2, and 3, respectively (DOE 2000a) The depth to the native soil horizons varies because the thickness of the artificial fill varies Figure 8 presents a sketch of the 903 Pad and subsurface

VOCs are present in subsurface soil at varying concentrations and depths and are dispersed throughout the soil column, from 5 to 20 feet in depth Methylene chloride is present sporadically in concentrations greater than the RFCA Tier I Action Level (AL) The concentration of methylene chloride generally increases with depth however it is not present continuously throughout the soil column Tetrachloroethene is present in concentrations greater than RFCA Tier I ALs at one location where methylene chloride is also present (DOE 2000a) Methylene chloride, dichloroethene, and trichloroethene are present in the subsurface, but carbon tetrachloride, which was present in drums stored at the 903 Pad, has not been detected The highest concentrations of VOCs are below the water table and may be at the bedrock contact

2.2 Project Conditions

The following conditions are present at this site

- The 903 Pad is 3 4 acres in size,
- An asphalt pad (approximately 6 inches) covers the site,
- A layer of artificial fill (approximately 6 inches to the gravel base) is beneath the asphalt pad,
- Radionuclides are present in the surface and shallow subsurface soil, and
- VOCs are present, sporadically, in the subsurface soil

2.3 Remediation Plan

In accordance with the ER RSOP, removal of soil with contaminant concentrations greater than RFCA Tier I ALs, by removing the depth of soil described herein, is required Additionally, soil with contaminant concentrations between RFCA Tier I and Tier II ALs requires evaluation to determine whether action to remove or manage the soil is indicated

The existing sampling data (Figures 2 through 7) indicate that all significant radionuclide contamination is within the top 12 inches of native soil with varying levels and depths Results from all of the 25 sampling locations indicate that the maximum plutonium radionuclide activity at depths greater than 12 inches of native soil is 48 pCi/g and is likely in the top of Native Soil Horizon 3 Therefore, using mechanical excavation

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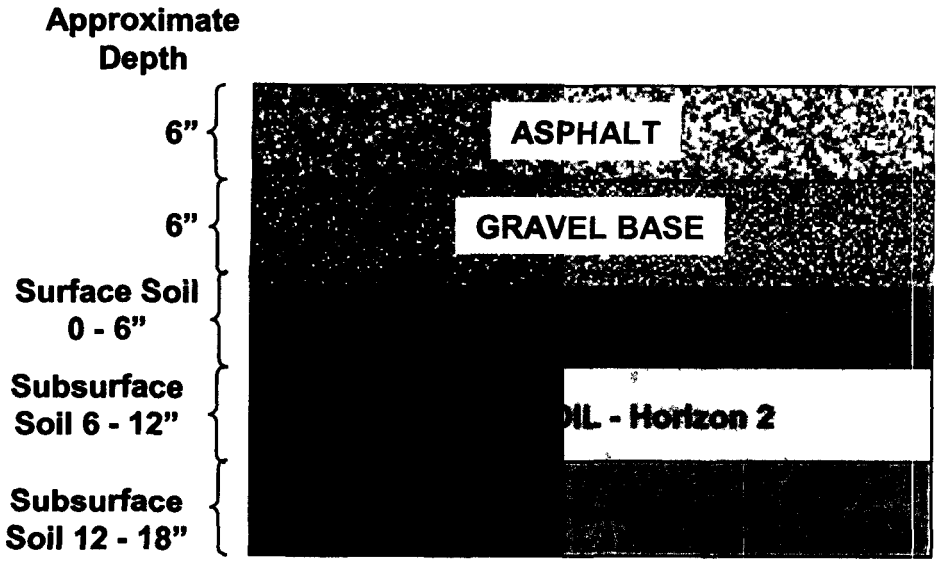
Figure 8
903 Pad Subsurface Cross Section



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equipment, the top 12 inches of native soil below the footprint of the pad will be removed (Figures 5 and 6 [DOE 2000a]) As a result of this action, it is anticipated that residual radioactivity in soil will be well below Tier II ALs and even approaching background levels (Figure 7 [DOE 2000a]) After the top 12 inches of native soil are removed, if the Tier I SOR is greater than 1 in underlying soil, an additional approximate 6-inch lift of native soil will be removed After soil with Tier I SORs greater than 1 is removed, the stewardship and as low as reasonably achievable (ALARA) evaluations will be conducted, using the consultative process with the regulatory agencies, to determine whether additional excavation is required

Soil excavation will be conducted within a 90-foot x 110-foot tent that will be used to protect the excavation from weather conditions and to mitigate possible weather-related delays Within the tent, the excavation area will be approximately 80 feet x 90 feet Subareas will be established on a grid within the tent based on the reach of the excavating equipment and tent logistics It is anticipated that there will be nine or sixteen subareas to a tent As excavation in the tent progresses, confirmation samples will be collected from the approximate middle of each subarea Upon receipt of in-process sample results, using gamma spectroscopy methods, the decision will be made (through the consultative process) to either remove another 6-inch lift of soil to achieve remediation goals, or to proceed with the backfill process When excavation and backfill activities within the tent are complete, the tent will be moved to the adjacent excavation area It is anticipated that the tent will be moved 20 times over the 903 Pad area

Removal of deeper VOC-contaminated subsurface soils is not being proposed at this time and will be addressed through the 903 Lip Area IM/IRA because of the following reasons

- The highest concentrations of VOCs are at or near the bedrock surface Excavation of scattered VOC-contaminated soil pockets at this depth is impractical because VOCs tend to be mobilized by excavation, which may result in incomplete removal
- Stringent radiological work controls will be in place during the 903 Pad radiological accelerated action Because the highest concentrations of VOCs are at or near the bedrock surface, large or deep excavations would be required Deep excavation of VOC-only contaminated soil would not be practical or cost effective under stringent radiological work controls
- Groundwater from the 903 Pad area is captured on the north by the Mound and East Trenches barrier and treatment systems Current data do not indicate that there is a pathway from groundwater to surface water on the south Consequently, VOC source removal may not be necessary
- VOC-contaminated subsurface soil can be properly evaluated and addressed comprehensively over the 903 Pad and Lip areas in the IM/IRA in conjunction with evaluation of groundwater and potential surface water impacts
- There is no in-situ treatment option for 903 Pad soil contaminated with plutonium and americium but, in-situ VOC treatment options (for example, application of

compounds that accelerate degredation) may provide equivalent or better reduction in VOC concentrations with less risk to workers

- Excavation of VOC-contaminated soil may result in generation of low-level mixed waste (LLMW), which would likely require treatment to meet disposal facility requirements This is not considered a cost-effective action

Based on existing data, it is not anticipated that VOC-contaminated soil will be encountered during this accelerated action Six waste characterization grab samples were collected over the 903 Pad footprint, at a depth of one foot, at locations biased towards elevated analytical results or field indicators All results are significantly below RFCA Tier I ALs and the soil is Land Disposal Restriction (LDR) compliant However, if VOC-stained soil is encountered, the consultative process will be used to determine if, and to what extent, VOC-contaminated soil will be removed at this time If VOCs are found within the top 12 inches of soil, the VOC-contaminated soil will be segregated for waste disposal

The proposed action for IHSS 112 – 903 Pad includes the following

- Remove asphalt and dispose as low-level waste (LLW) (approximately 2,743 cubic yards [cy]),
- Remove artificial fill to the base of the gravel (approximately 3,429 cy) and dispose as appropriate, pending waste characterization,
- Remove the top 1 foot of native soil at the 903 Pad (approximately 6,858 cy) and additional soil as necessary to removal all soil with contaminant concentrations greater than RFCA Tier I ALs and as indicated by ALARA and stewardship evaluations, and dispose as appropriate, pending waste characterization,
- Collect confirmation samples in accordance with the Buffer Zone Sampling and Analysis Plan (BZSAP [DOE 2002b]) (Section 4 5), and
- Backfill with clean soil, regrade, and revegetate

2.4 Soil Removal Alternatives

Three alternatives were evaluated for the 903 Pad Area removal of approximately one foot of soil below the asphalt and artificial fill, stabilization/capping, and no action These alternatives were compared against three evaluation criteria effectiveness, implementability, and relative cost in accordance with RFCA Appendix 3, Implementation Guidance Document (DOE, et al 1999) Stewardship impacts have also been included in the evaluation The results of this evaluation are summarized in Table 1

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Table 1
Alternative Analysis

Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
Alternative 1 Removal of one foot of soil across the 903 Pad Area and disposal offsite	In the short-term, there may be adverse impacts to surface water quality, an increase in fugitive dust emissions, and transportation of radioactive material Approximately 398 shipments of LLW are anticipated (See Section 13 0 of the ER RSOP) Potential impacts to water and air are temporary and controllable with mitigation measures as described in the Remediation Plan (Section 2 3) This alternative will be protective of public health and the environment in the long-term because removal of one foot of soil across the 903 Pad Area will result in residual contamination less than 50 pCi/g in all sections and close to background values in most sections of the 903 Pad Area This alternative will achieve Applicable or Relevant and Appropriate Requirements (ARARs) including the following – National Emission Standards	This alternative is technically feasible because removal would be implemented using standard construction equipment and would be staged in a weather protective tent The tent will also provide mitigation measures for potential impacts to air and water quality Offsite facilities exist for the disposal of the radioactive waste that will be excavated during the action This alternative is believed to be acceptable to the State and local communities	Approximately $9,446,000	Removal could result in the following – Decreased impacts to surface water from runoff, – Decreased monitoring requirements, and – Potential removal of institutional controls

Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
	for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (40 Code of Federal Regulations [CFR] 61, subpart H), – Solid Waste Disposal Act (Resource Conservation and Recovery Act [RCRA]) Colorado Hazardous Waste Act (CHWA) (6 Code of Colorado Regulations [CCR] 1007-2), and – Radiation Control (6 CCR 1007-1) Toxicity and mobility will be reduced because radionuclide contaminated soil will be removed			
Alternative 2 Stabilization/Capping	In the short term, there may be adverse impacts to surface water quality and an increase in fugitive dust emissions during stabilization and cap construction This alternative will be protective of public health and the environment because stabilization will reduce surface soil dispersion and surface water runoff Long-term effectiveness will require institutional controls This alternative will achieve ARARs	This alternative is technically feasible because the cap construction uses standard construction and earth moving equipment Stabilization would be conducted using common mixing equipment such as mixing injectors, rippers, disk harrows While technically feasible, this alternative	Costs for this alternative are likely to be less than Alternative 1 in the near term However, this remedy is less effective than Alternative 1 and will require additional long-term	Stabilization/Capping could result in the following – Increased monitoring requirements including either additional monitoring stations or longer term monitoring, – Increased long-term stewardship costs, and – Long-term institutional controls

Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
	including the following – National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities (40 CFR 61, subpart H), – Solid Waste Disposal Act (RCRA) Colorado Hazardous Waste Act (CHWA) (6 CCR 1007-2), and – Radiation Control (6 CCR 1007-1) Mobility will be decreased because surface soil dispersion via wind erosion and surface water runoff will be reduced The cap will reduce the migration of contaminants into subsurface soils by reducing the infiltration of surface water and directing surface water runoff away from the area Stabilization will reduce contaminant mobility by reducing the potential for these contaminants to migrate as dust become entrained with surface water runoff, or infiltrate further into subsurface soils	would result in additional institutional controls for the 903 Pad Area and increased monitoring either through additional monitoring stations or longer-term monitoring While this alternative could be implemented, it will not be consistent with the comprehensive final remedy for radionuclides in near surface soil at the Site or the likely removal action for surface soils in the 903 Lip Area Stabilization additives and capping materials would likely increase the amount of soil that would require remediation in the future Also, as presented in the VOC discussion (Section 2 3), the presence of radionuclides at current concentrations would be expected to complicate a response to the VOC plume This alternative is not	stewardship costs	

Alternative Description	Effectiveness	Implementability	Relative Cost	Stewardship Impacts
		acceptable to the State or local communities		
Alternative 3 No action	In the short-term there would be no increased adverse impact to water quality, fugitive dust emissions, or transportation of radioactive material since the soil in the 903 Pad would not be disturbed However, this alternative is not effective for overall protection of public health and the environment in the long-term, nor would ARARs be achieved, since "no action" will result in soil with radionuclide contaminant concentrations greater than Tier I ALs Toxicity and mobility would not be reduced	While technically feasible, no action could result in additional institutional controls for the 903 Pad Area and increased monitoring either through additional monitoring stations or longer-term monitoring This alternative is not acceptable to the State or local communities	$0	No action could result in the following – Increased monitoring requirements including either additional monitoring stations or longer term monitoring, – Increased long-term stewardship costs, and – Long-term institutional controls

The alternative selected for this accelerated action must be protective of human health and the environment The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also requires that the selected cleanup alternative comply with ARARs established under federal and state laws, to the extent practicable, or justify a waiver for the requirements The removal action must be cost effective and utilize technologies that result in a permanent action to the maximum extent possible

The alternative analysis resulted in an alternative that is effective and implementable under the ER RSOP The preferred alternative for the 903 Pad area is Alternative 1 removal of one foot of soil across the 903 Pad Area and disposal offsite Alternative 1, while not the most cost-effective option, provides overall protection of human health and the environment and compliance with ARARs Alternative 2 also provides overall protection of human health and the environment but will require additional stewardship actions Alternative 3 does not provide overall protection of human health and the environment Alternatives 2 and 3 are less acceptable to the community

2.5 Stewardship Evaluation

Based on the COCs (see Section 2 1) and the ER RSOP (DOE 2002a), it is anticipated that all contamination above RFCA Tier I ALs will be remediated It is also anticipated that after 1 foot (depth) of soil is removed, most contamination above RFCA Tier II ALs will be remediated The potential remediation area is shown on Figure 9 Additional remediation to below Tier I ALs is not required by RFCA, but will be evaluated using the consultative process A map of residual contamination will be generated after remediation The following sections contain the stewardship evaluation

2.5.1 Proximity to Other Contaminant Areas

IHSS 112 – 903 Pad is located in the RFETS BZ Nearby potential contaminant areas include IHSS 155 – 903 Lip Area, which also contains IHSS 140 – Hazardous Disposal Area These sites, PCOCs, media of interest, proximity, and relationships to IHSS 112 – 903 Pad are listed in Table 2 and shown on Figure 9

Table 2
Other Potential Contaminant Sources for IHSS Group 900-11, IHSS 112 – 903 Pad

IHSS Group/IHSS	PCOCs/COCs	Media	Distance from IHSS Group 900-11, IHSS 112 – 903 Pad
900-11 – IHSS 155 – 903 Lip Area	Radionuclides VOCs	Surface and Subsurface Soil Subsurface Soil	Adjacent to the east and south
900-11 – IHSS 140 – Hazardous Disposal Area	Metal VOCs	Surface Soil Subsurface Soil	Approximately 128 feet to the southeast

IHSS 155 is the result of erosion and transport action of plutonium by wind and water from IHSS 112 – 903 Pad IHSS 140 was used for the destruction and disposal of reactive metals and other chemicals such as solvents

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2.5.2 Surface Water Protection

Surface water protection includes the following considerations

Is there a pathway to surface water from potential erosion to streams or drainages?

Surface water runoff from the western end of the 903 Pad flows north and then west into the ditch south of Central Avenue where it is sampled at location GS39 Runoff from the northeastern region of the 903 Pad flows east into a small ditch and eventually to a borrow ditch east of the 903 Lip Area Flow from the borrow ditch is routed through a culvert leading to surface water performance monitoring location SW055 Surface water flows from SW055 toward the SID

Do characterization data indicate there are contaminants in surface soil?

Table 3 lists radionuclide data (DOE 2000a) from IHSS Group 900-11, IHSS 112 – 903 Pad, along with background values and RFCA ALs for comparison As shown in this table, americium-241 and plutonium-239/240 activities in surface and near-surface soil are greater than the RFCA Tier I AL Additionally, uranium-238 activity is greater than RFCA Tier II ALs in surface soil

Table 3
Surface and Near-Surface Soil Characterization Summary

Analyte	Maximum Result (pCi/g)	Background Plus Two Standard Deviations (pCi/g)	Tier I AL (pCi/g)	Tier II AL (pCi/g)
Americium-241	31,670 00	0 0227	215	38
Plutonium-239/240	152,260 0	0 066	1,429	252
Uranium-233/234	178 0	2 253	1,738	307
Uranium-235	16 9	0 0939	135	24
Uranium-238	780 0	2	586	103

Do monitoring results from Points of Evaluation (POEs) or Points of Compliance (POCs) indicate there are surface water impacts from the area under consideration?

There are no POEs or POCs in the vicinity of IHSS 112 – 903 Pad The closest surface water monitoring station is GS39, which receives runoff from the western end of the 903 Pad (K-H 2001) Monitoring data from GS39 (DOE 1999a, 1999b, 2000b, 2000c, 2000d, 2000e, 2001b, 2001c, 2001d, 2001e, 2002c) are summarized in Table 4 Additional surface water monitoring stations designed to monitor surface water quality in the subbasins draining the 903 Area were installed through the Integrated Monitoring Program (IMP) New surface water stations include SW055, GS52, GS53, and GS54 (K-H 2001) Preliminary results indicate that plutonium-239/240 is present in concentrations of 0 432 picocuries per liter (pCi/L) and americium-241 is present in concentrations of 0 084 pCi/L in surface water at SW055 Results from the other new monitoring stations are not available

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Table 4
Surface Water Results From GS39

Analyte	Maximum Result (pCi/L)	Woman Creek ALs and Standards (pCi/L)	Walnut Creek ALs and Standards (pCi/L)
Americium-241	0 083	0 15	0 15
Plutonium-239/240	0 64	0 15	0 15
Uranium (Total)	2 09	11	10

Is the IHSS Group in an area with high erosion potential, based on the 100-Year Average Erosion Map?

While most of the 903 Pad area is flat lying, the southeastern portion of IHSS 112 – 903 Pad, is shown on the 100-Year Average Erosion Map (DOE 2002a) as being in an area subject to approximately 0 018 pounds per square yard of detachment Erosion in the area (the hill slope including the southeastern corner of the 903 Pad to the South Interceptor Ditch) could average approximately 0 880 tonnes per hectare per year (DOE 2000f) Most of the erosion potential for this area is due to the slope south of the 903 Pad Area Erosion potential for most of the 903 Pad Area is very low, while erosion potential for the southeastern corner increases slightly

2.5.3 Monitoring

Monitoring includes the following considerations

Do monitoring results from POEs or POCs indicate there are groundwater impacts from the area under consideration?

Groundwater monitoring results from wells in the 903 Pad area (DOE 1995) indicate that americium-241, plutonium-239/240, uranium-235, and uranium-238 activities are greater than RFCA Tier II ALs, and americium-241 activities are greater than the RFCA Tier I ALs Table 5 lists the maximum results from IHSS 112 – 903 Pad wells that exceeded RFCA Tier II ALs

Table 5
Groundwater Exceedances Associated With IHSS Group 900-11, IHSS 112- 903 Pad

Analyte	Maximum Result (pCi/L)	Tier I AL (pCi/L)	Tier II AL (pCi/L)
Americium-241	21 31	14 5	0 145
Plutonium-239/240	0 812	15 1	0 151
Uranium-235	1 5	101	1 01
Uranium-238	75 73	76 8	0 768

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Groundwater quality in this area may have been impacted by radionuclide contamination from IHSS 112 – 903 Pad

Can the impact be traced to a specific IHSS Group?

Radionuclides in groundwater monitoring wells at IHSS 112- 903 Pad are similar to constituents detected above background plus two standard deviations in subsurface soil near these sites

Are additional monitoring stations needed?

Wells 1587, 1687, 06591, 06691, 06791, 06891, 06991, 07191, 08891, 09091, 13091, 13191, 13291, and 50199 are being removed from the 903 Pad area because they are in, or near, the soil removal area or they will no longer provide relevant information Well locations are shown on Figure 10 Two new wells, 90402 and 90502, are being added to monitor remediation activities, however, their location has not been finalized These wells will also be evaluated, after remediation, to determine if they will be needed for long-term monitoring

Can existing monitoring locations be deleted if additional remediation is conducted?

The monitoring stations will still be needed to detect VOC concentrations in groundwater

2.5.4 Stewardship Actions and Recommendations

The stewardship actions and recommendations for IHSS 112 – 903 Pad are as follows

- Use best management practices (BMPs) to control runoff to nearby surface water during remediation, including excavation inside a weather tent
- Implement near-term institutional controls until final closure and stewardship decisions are implemented, including the following
  - Signs and barriers,
  - Restrictions on soil excavation, and
  - Soil excavations controlled through the Site Soil Disturbance Permit process
- Implement long-term stewardship actions, including the following
  - Federal ownership, and
  - Land use restrictions to prevent soil excavation Specific land use restrictions will be discussed in the Site Long-Term Stewardship Plan

These recommendations may change based on in-process remediation activities and other future RFETS remediation decisions

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2.6 Accelerated Action Remediation Goals

ER RSOP remedial action objectives include the following

1 Provide a remedy consistent with the RFETS goal of protection of human health and the environment,

2 Provide a remedy that minimizes the need for long-term maintenance and institutional or engineering controls, and

3 Minimize the spread of contaminants during implementation of accelerated actions

The accelerated action remediation goals for IHSS 112 – 903 Pad include the following

- Remove asphalt and dispose as LLW (approximately 2,743 cy),
- Remove artificial fill (approximately 3,429 cy) and dispose as appropriate, pending waste characterization,
- Remove the top 1 foot of native soil at the 903 Pad (approximately 6,858 cy) and additional soil as necessary to removal all soil with contaminant concentrations greater than RFCA Tier I ALs and as indicated by ALARA and stewardship evaluations and dispose as appropriate, pending waste characterization,
- Evaluate remaining soil for additional removal through the consultative process using stewardship and ALARA considerations (Sections 5 4 and 5 5 of the ER RSOP), and
- Backfill with clean soil, regrade, and revegetate

2.7 Treatment

Not applicable

2.8 Confirmation Sampling

Confirmation samples will be collected to determine if accelerated action goals have been achieved A 90-foot x 110-foot weather tent will be used to protect the excavation from weather-related delays An estimated twenty areas (80 feet x 90 feet each) will be excavated within the tent Subareas, either nine or sixteen to a tent, will be excavated and confirmation samples will be collected from the approximate middle of each subarea This will result in at least 180 confirmation samples over the 903 Pad area Because there may be some variation in the reach of the construction equipment and because of the tent structure, the exact size of the excavation subsections will be determined in the field

2.9 Project-Specific Monitoring

Project-specific surface water and groundwater monitoring during remediation was planned through the yearly IMP process where additional monitoring is considered for

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Decontamination & Decommissioning (D&D) and remediation projects Air monitoring will be conducted in accordance with the Performance Monitoring for Radionuclides 903 Pad Remediation Project (IHSS 112 & 155) (K-H 2002)

2.10 Resource Conservation and Recovery Act Units and Intended Waste Disposition

Not applicable

2.11 Administrative Record Documents

DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Golden, Colorado

DOE, 1995, Final Phase II RFI/RI Report for Operable Unit 2, 903 Pad, Mound and East Trenches Area, Rocky Flats Plant, Golden, Colorado, December

DOE, 1999, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 1999, Golden, Colorado, August

DOE, 1999, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, July - September 1999, Golden, Colorado, November

DOE, 2000, Characterization Report for the 903 Drum Storage Area, 903 Lip Area, and Americium Zone, Rocky Flats Environmental Technology Site, Golden, Colorado, June

DOE, 2000, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, October - December 1999, Golden, Colorado, November

DOE, 2000, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, January - March 2000, Golden, Colorado, May

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DOE, 2000, Report on Soil Erosion and Surface Water Sediment Transport Modeling for the Actinide Migration Evaluations at the Rocky Flats Environmental Technology Site, Golden, Colorado

DOE, 2001, Draft Buffer Zone Data Summary Report, Rocky Flats Environmental Technology Site, Golden, Colorado, July

DOE, 2001, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, October - December 2000, Golden, Colorado, February

DOE, 2001, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, January - March 2001, Golden, Colorado, May

DOE, 2001, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 2001, Golden, Colorado, August

DOE, 2001, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, July - September 2001, Golden, Colorado, November

DOE, 2002, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, October - December 2001, Golden, Colorado, February

DOE, 2002, Environmental Restoration RFCA Standard Operating Protocol for Routine Soil Remediation, Rocky Flats Environmental Technology Site, Golden, Colorado, January

DOE, 2002, Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June

DOE, CDPHE, and EPA, Rocky Flats Cleanup Agreement, Rocky Flats Environmental Technology Site, Golden, Colorado, July

DOE, CDPHE, EPA, Kaiser-Hill, and RMRS, Rocky Flats Cleanup Agreement, Appendix 3 RFCA Implementation Guidance Document, July

Kaiser-Hill Company, L L C, 2001, Project Plan for Surface Water Performance Monitoring of the 903 Drum Storage Area (IHSS 112) and Lip Area (IHSS 155) to Establish Baseline Surface Water Quality, July

Kaiser-Hill Company, L L C , 2002, Performance Monitoring for Radionuclides 903 Pad Remediation Project (IHSSs 112 & 155), May

2.12 Projected Schedule

Remediation of IHSS 112 – 903 Pad is scheduled to begin in October 2002 It is anticipated that this project will take 6 months to complete

3.0 PUBLIC PARTICIPATION

ER RSOP Notification #02-09 activities were discussed at several ER/D&D Status meetings Additionally, ER RSOP Notification was subject to a 30-day public review process This Notification is available at the Rocky Flats Reading Rooms

4.0 REFERENCES

DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Golden, Colorado

DOE, 1995 Final Phase II RFI/RI Report for Operable Unit 2, 903 Pad, Mound and East Trenches Area, Rocky flats Plant, Golden Colorado, December

DOE, 1999a, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, April - June 1999, Golden, Colorado, August

DOE, 1999b, Rocky Flats Environmental Technology Site, Quarterly Environmental Monitoring Report, July - September 1999, Golden, Colorado, Novembei

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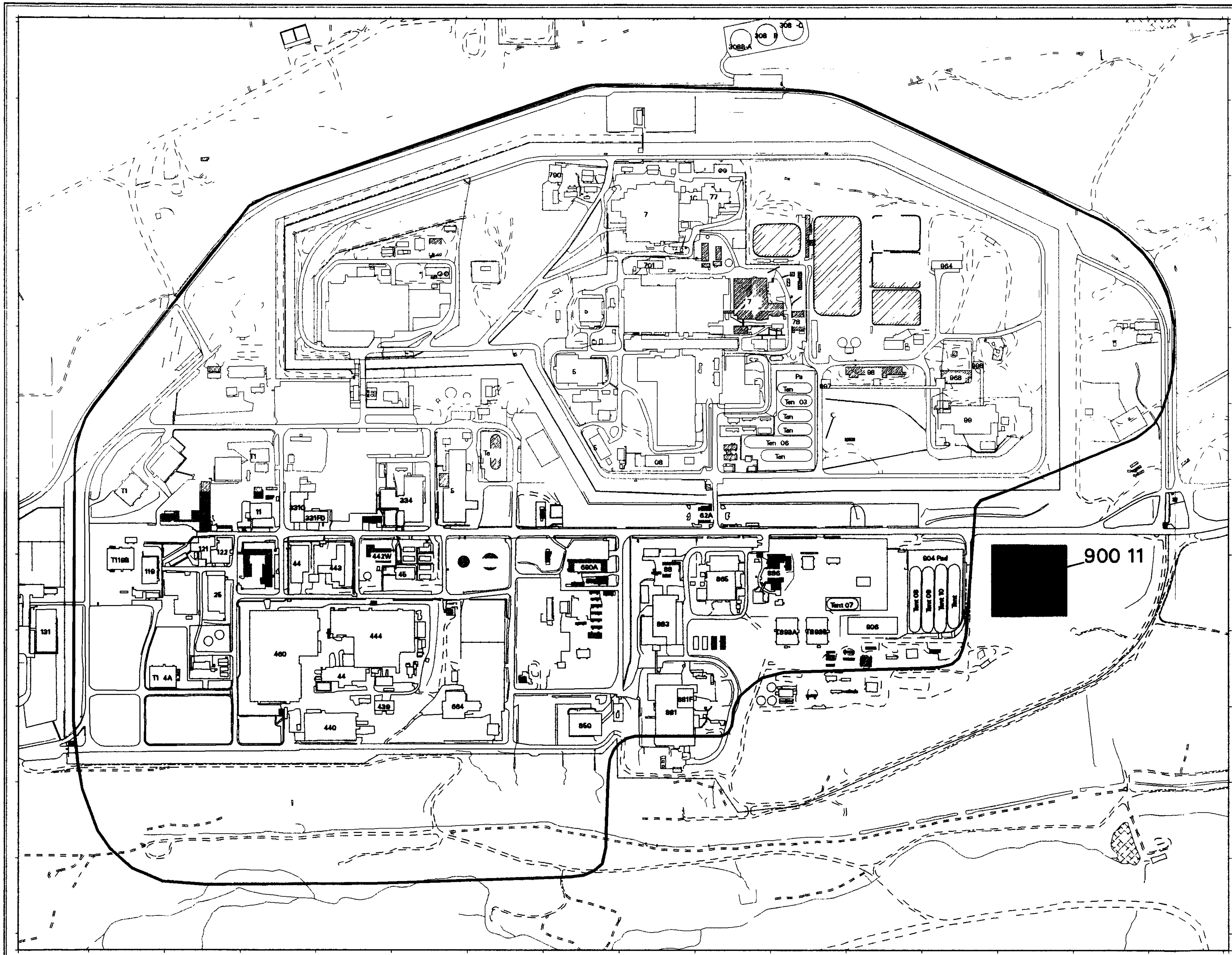

Figure 1
IA Groups Location Map

EXPLANATION

IHSS G ouping

900 11 (ly IHSS 112)

Sta d d M p F t es

B ng nd uc

D mo h d b ld ngs

S E po Po d (EP)

La d po d

ma d t he or he dr ge f

Fe d h ba

Paved ro d

D ads

Bo ry pe

DATA SOURC BASE EATURE
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2nd nnual pdat
Sept 30 99
Individ zardous Substance Sit ll SS
OE 99 HR part and Subseq ent pd es
Buildings, ences, ydrog ph oads nd other
ru ture rom 994 aerial fly-over
ca ured b G&G SI Las Vegas.
Digitized rom orthophotogr ph /95

Scale 1 30
1 inch represents pproximatel 528 fee

0 300 60

State Plane Coordinate Projection
Colo ad Ce l Zone
Datum NAD27

U S D partment of Energy
Rocky Flats Environmental T chnology Sit

IS Dept 303-966-770

Prepared by: **DynCorp**

Prepared f KAISER HILL

June 1, 200

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2084500 2085000 2085500 2086000 2086500 2087000 2087500

750000 749500 749000 748500

Analyte	Result	Units	Mea plus	Tie 2	Tie 1
PLUTON UM-239/240	00000	PCI/G		252 00000	29 00000
RAN M-234	000	PCI/	2.25	30 00000	738 00000
AMERICIUM-	00000	PCI/	02	38.00000	00000
RAN M-238	50000	PC /	00	03 00000	586 00000

Analyte	Result	Units	Mea plus	Tie 2	Tier 1
PLUTON M-239/240	260 00000	PCI/G		252 00000	429 00000
AMERICI M-	69 50000	PCI/G	02	38 00000	00000

Analyte	Result	Units	Mea plus	Tier 2	Tier 1
PLU O M-239/240	00000	PCI/G		252 00000	429 00000
RAN M-238	000	PCI	00	03 00000	586 00000

Analyte	Res lt	Units	Mea plus	Tie 2	Tier 1
PLU ON M-239/240	00000	PC/G		25 00000	429 00000
RAN M-234	58000	PCI/G		30 00000	738 00000
AMERICI M-	00000	PC		38 00000	00000

Analyte	Result	Units	Mea plus	Tie 2	Tier 1
RAN M-238	68000	PC /G	00	0 00000	586 00000

Analyte	Result	Units	Mea plus	Tie 2	Tier 1
PLU ON M-239/240	284 00000	PCI/G		252 00000	429 00000
AMERICI M-	50 40000	PC	02	38 00000	00000
RAN UM-238	68000	PCI/	00	03 00000	586 00000

Analyte	Result	Units	Mea plus	Tier 2	Tie 1
RAN M-238	000	PCI/G	00	03 00000	586 00000

Analyte	Result	U rts	Mea plus	Tie 2	Tie 1
PLU O M- 39/240	06 00000	PC		252 00000	29 00000
AM M	880 00000	PC	02	38 00000	00000
RAN M 238	92000	PCI/G	00	0 00000	586 00000

Analyte	Result	Units	Mea plus	Tier 2	Tier 1
PLU ON M-239/240	00000	PCI/		52 00000	29 00000
RAN UM-234	80000	PCI/	.25	30 00000	38 00000
AM R C M-	268 00000	PCI/	02	38 00000	00000
RAN UM-238	26 80000	PCI/	00	00000	586 00000

Analyt	Res lt	U its	Mea plus	Te 2	Ti 1
P U ON M 39/240	00000	PC		25 00000	29 00000
AM M	33 90000	PCI	02	38 00000	00000
RAN M-238	59000	PC	00	00000	586 00000

Analyte	Res lt	U its	Mea plus	Tie 2	Tie 1
P U ON UM- 39/240	6600 00000	PC		252 00000	29 00000
RAN M-234	78 00000	PC	25	30 00000	38 00000
AM RI M	00000	PC	02	38 00000	00000
RAN M-235	90000	PC	09	00000	35 00000
RAN M 38	80 00000	PC	00	0 00000	586 00000

Analyte	Result	Units	Mea plus	Tie 2	Tie 1
ON M-239/240	00000	PC		252 00000	29 00000
AM C M	80000	PC	02	38 00000	00000
RAN M-238	54000	PC	00	0 00000	586 00000

An lyt	Res lt	U rts	Mea pl	T 2	T 1
AM M	46 00000	PC	02	38 00000	209 00000
PLUTO M-239/240	68 00000	PCI/G	06	5 00000	088 00000
RAN UM-234	6 8000	PC		30 00000	62 00000
URAN UM- 38	20000	PCI/G	00	0 00000	506 00000
RAN M-235	4000	PC	09	25 00000	088 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	2500.00000	PCI/G	0.07	252.00000	1429.00000
AMERICIUM-24	377.00000	PCI/G	.02	38.00000	2 5.00000
URANIUM-238	.23000	PCI/G	2.00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
AMERICIUM-24	8.00000	PCI/G	0.02	38.00000	5.00000
URANIUM-238	2.68000	PCI/G	2.00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	52280.00000	PCI/G	0.07	252.00000	429.00000
AMERICIUM-24	670 00000	PCI/G	02	38.00000	215.00000
URANIUM-238	26.20000	PCI/G	2.00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	2420 00000	PCI/G	.07	252.00000	429 00000
AMERICIUM-24	554.00000	PCI/G	0.02	38.00000	2 5.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
AMERICIUM-24	3930.00000	PCI/G	02	38.00000	2 .00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	00000	PCI/G	07	252.00000	429.00000
AMERICIUM-24	59 90000	PCI/G	0.02	38.00000	215.00000
RANIUM-238	0000	PCI/G	00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
RANIUM-234	.30000	PCI/G	2.25	307.00000	738.00000
AMERICIUM-24	2.40000	PCI/G	.02	38.00000	21 .00000
URANIUM-238	.03000	PCI/G	2.00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	00000	PCI/G	07	252.00000	429.00000
AMERICIUM-24	000	PCI/G	02	38.00000	215.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	04 00000	PCI/G	07	252.00000	429 00000
AMERICI M-24	80000	PCI/G	02	38.00000	2 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	7980 00000	PCI/G	07	252.00000	429 00000
AMERICIUM-24	535 00000	PCI/G	0.02	38.00000	00000
URANIUM-238	72000	PCI/G	00	03.00000	586.00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	00000	PCI/G	07	252.00000	429 00000
AMERICIUM-24	.88000	PCI/G	02	38 00000	2 00000

Figure 2
Native Soil Horizon 1
Approximately 0-6
Exisiting Sampling Data
Greater Than Background
Plus 2 Standard Deviations

KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream ditch or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1 2 100

60 0 60 120 180 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

KAISER•HILL COMPANY

903padcharacterization apr June 2002

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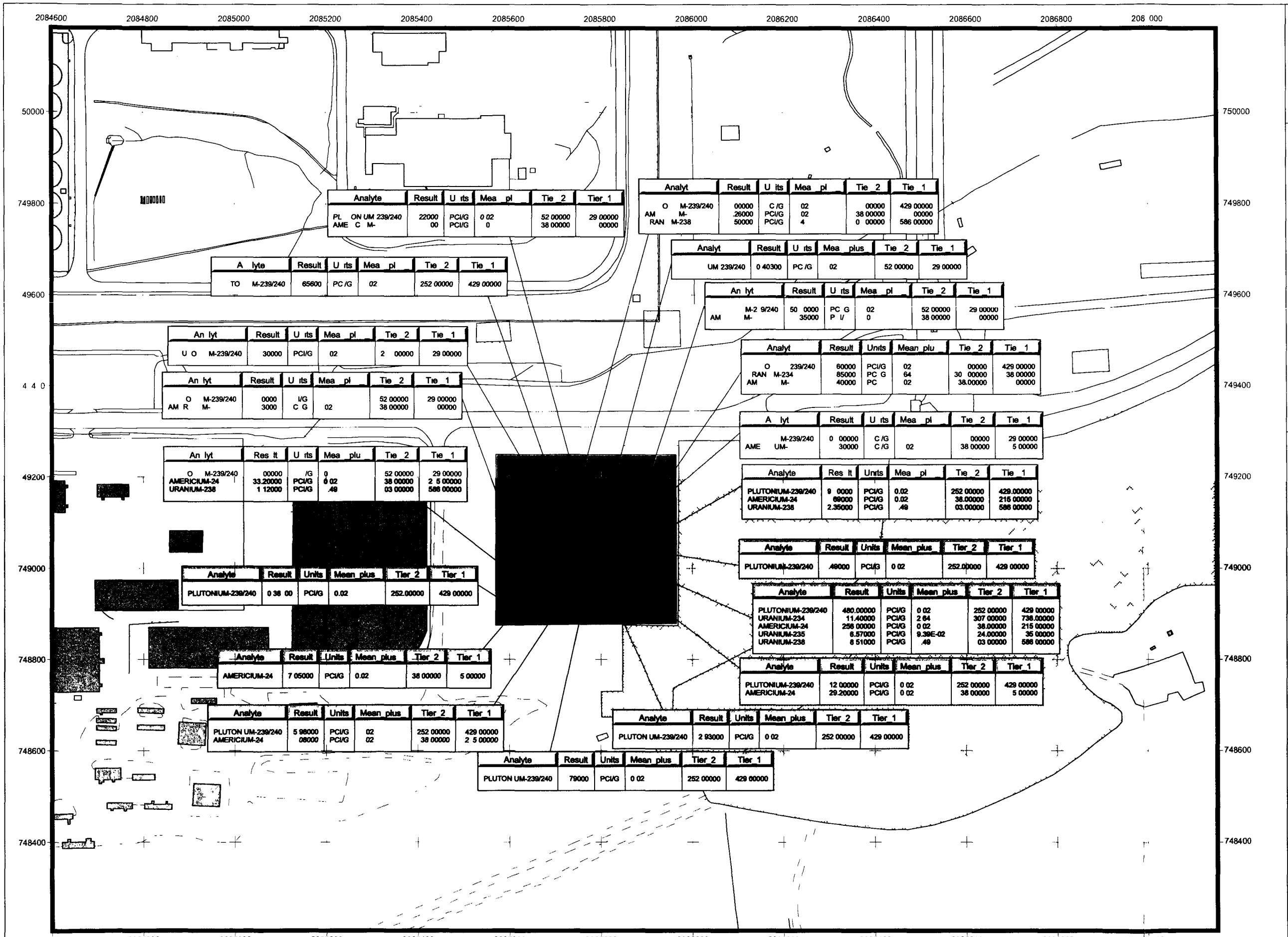

Analyte	Result	U rts	Mea pl	Tie 2	Tier 1
PL ON UM 239/240	22000	PCI/G	0 02	52 00000	29 00000
AME C M-	00	PCI/G	0	38 00000	00000

A lyte	Result	U rts	Mea pl	Tie 2	Tie 1
TO M-239/240	65600	PC /G	02	252 00000	429 00000

An lyt	Result	U rts	Mea pl	Tie 2	Tie 1
U O M-239/240	30000	PCI/G	02	2 00000	29 00000

An lyt	Result	U rts	Mea pl	Tie 2	Tie 1
O M-239/240	0000	I/G		52 00000	29 00000
AM R M-	3000	C G	02	38 00000	00000

An lyt	Res lt	U rts	Mea plu	Tie 2	Tie 1
O M-239/240	00000	/G	0	52 00000	29 00000
AMERICIUM-24	33.20000	PCI/G	0 02	38 00000	2 5 00000
URANIUM-238	1 12000	PCI/G	.49	03 00000	586 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	0 38 00	PCI/G	0.02	252.00000	429 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
AMERICIUM-24	7 05000	PCI/G	0.02	38 00000	5 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTON UM-239/240	5 98000	PCI/G	02	252 00000	429 00000
AMERICIUM-24	08000	PCI/G	02	38 00000	2 5 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTON UM-239/240	79000	PCI/G	0 02	252 00000	429 00000

Analyt	Result	U rts	Mea pl	Tie 2	Tie 1
O M-239/240	00000	C /G	02	00000	429 00000
AM M-	26000	PCI/G	02	38 00000	00000
RAN M-238	50000	PCI/G	4	0 00000	586 00000

Analyt	Result	U rts	Mea plus	Tie 2	Tie 1
UM 239/240	0 40300	PC /G	02	52 00000	29 00000

An lyt	Result	U rts	Mea pl	Tie 2	Tie 1
AM M-2 9/240	50 0000	PC G	02	52 00000	29 00000
M-	35000	P I/	0	38 00000	00000

Analyt	Result	Units	Mean plu	Tie 2	Tie 1
O 239/240	60000	PCI/G	02	00000	429 00000
RAN M-234	85000	PC G	64	30 00000	38 00000
AM M-	40000	PC	02	38.00000	00000

A lyt	Result	U rts	Mea pl	Tie 2	Tie 1
M-239/240	0 00000	C /G		00000	29 00000
AME UM-	30000	C /G	02	38 00000	5 00000

Analyte	Res lt	Units	Mea pl	Tie 2	Tie 1
PLUTONIUM-239/240	9 0000	PCI/G	0.02	252 00000	429.00000
AMERICIUM-24	89000	PCI/G	0.02	38.00000	215 00000
URANIUM-238	2.35000	PCI/G	.49	03.00000	586 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	.49000	PCI/G	0 02	252.00000	429 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	480.00000	PCI/G	0 02	252 00000	429 00000
URANIUM-234	11.40000	PCI/G	2 64	307 00000	738.00000
AMERICIUM-24	256 00000	PCI/G	0 02	38.00000	215 00000
URANIUM-235	6.57000	PCI/G	9.39E-02	24.00000	35 00000
URANIUM-238	6 51000	PCI/G	.49	03 00000	586 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTONIUM-239/240	12 00000	PCI/G	0 02	252 00000	429 00000
AMERICIUM-24	29.20000	PCI/G	0 02	38 00000	5 00000

Analyte	Result	Units	Mean plus	Tier 2	Tier 1
PLUTON UM-239/240	2 93000	PCI/G	0 02	252 00000	429 00000

Figure 3
Native Soil Horizon 2
6 12
Existing Sampling Data
Greater Than Background
Plus 2 Standard Deviations

KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream ditch or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1 2 500

40 0 40 80 120160200 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

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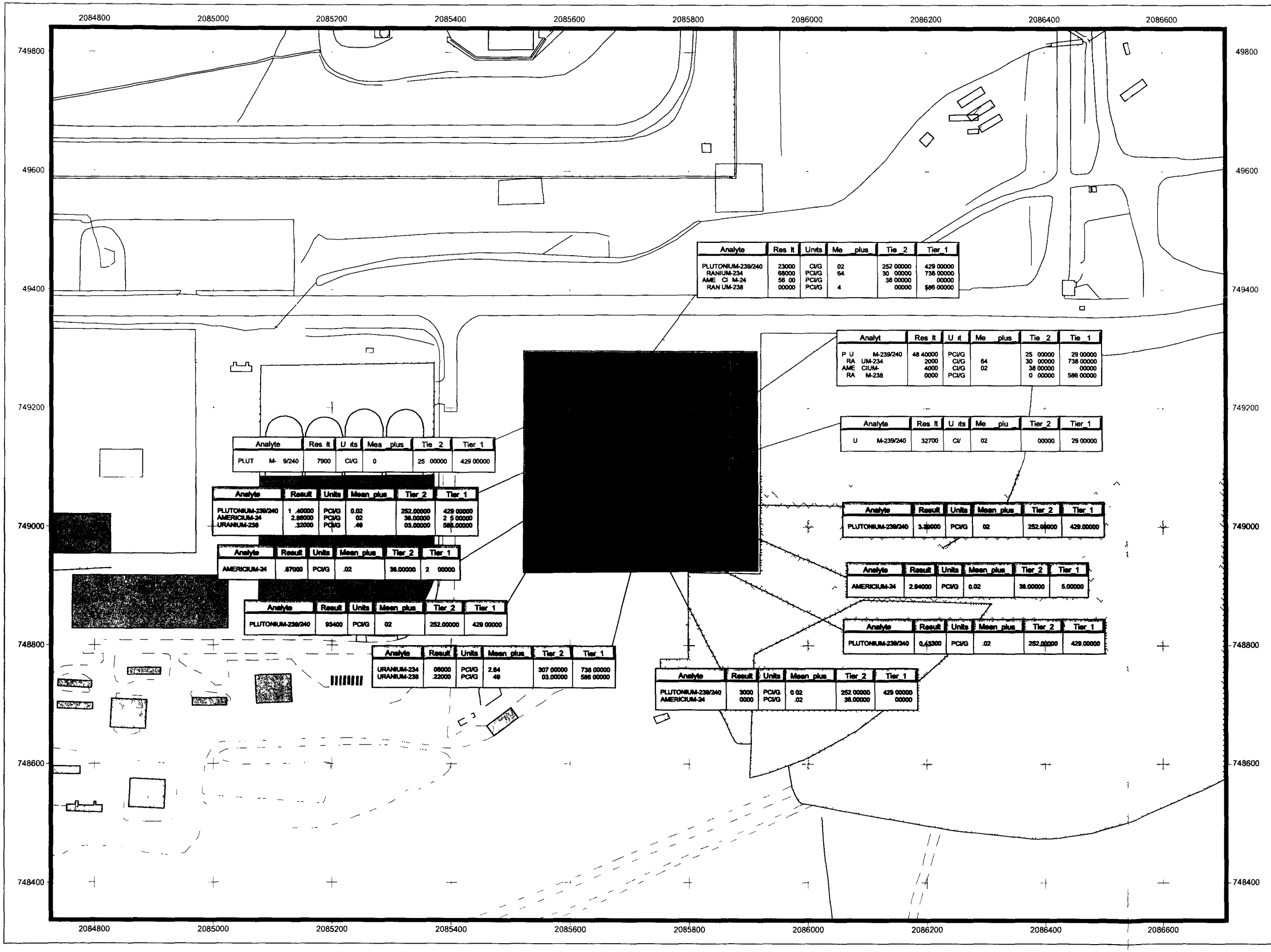

Figure 4
Native Soil Horizon 3
Approximately 12 to 18
Existing Sampling Data
Greater Than Background
Plus 2 Standard Deviations

KEY

- IHSS 112
- IHSS
- PAC
- Building or other structure
- Stream ditch or other drainage
- Paved area
- Fence
- Dirt Road
- Existing Sampling Location

N

Scale =1 1900

30 0 30 60 90 120150 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum NAD27

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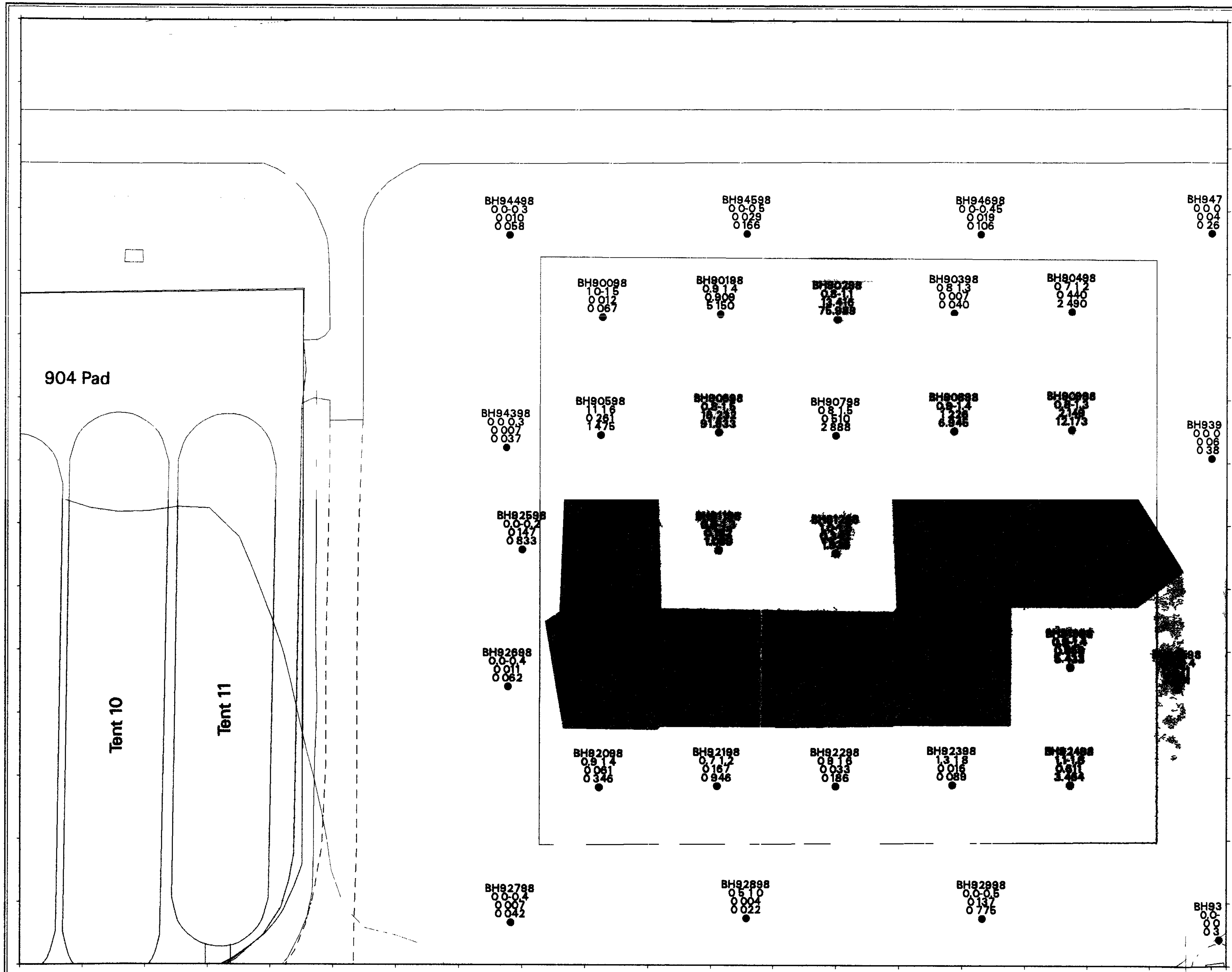

Figure 5

Native Soil Horizon 1

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Bo eh l lo ti

- Lo at
  Sampl D p h (ft)
  T l S m f Ra
  T ll S m f Rat
- E d T l
- E d T ll

St da d M p F tur

- Bu ld g d th t
- Lak and po d
- S m d h th d a g f at
- Fe nd h b
- T p g ph C (20 Fo)
- Pa d ad
- D rt d

DATA SOURCE BASE FEATURES: Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95. Topographic contours were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using EMV Arc TIN and LATTICE processes. The DEM data ... create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover ... meter resolution. DEM post-processing performed by MK, Winter 1995.

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Sc le 1 770
1 inch repr sent pproximately 64 feet

0 40 80

State Plane Co rdinate Pr jectio
Colo ado Cent l Z ne
D tum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: **DynCorp**

Prepa d f KAISER HILL

June 27, 2002

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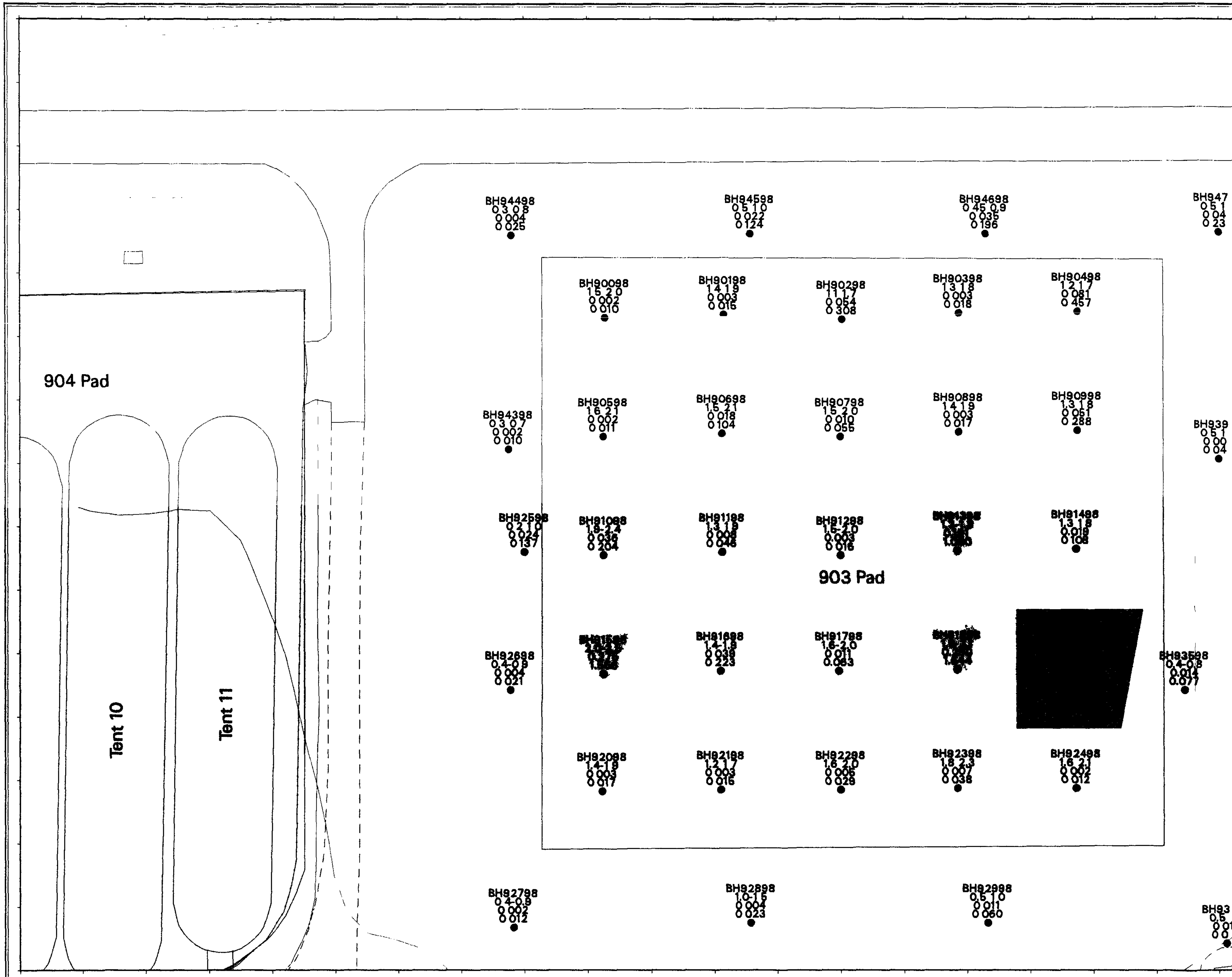

Figure 6

Native Soil Horizon 2

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Bo hol lo t n

● Lo at
Sampl Dep h (ft)
T IS m f R t
T IIS m f Rat

Exc d T I

E d T II

Stand rd M p F tu e

Build g d th t

Lak d p d

S m d h th d ag feat

Fe d h b

T p g ph C t (20 Fo t)

Pa d ad

D rt d

DATA SOURCE BASE FEATURES: Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95 Topographic contours were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover 10 meter resolution. DEM post-processing performed by MK, Winter 199

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Sc le 1 770
1 nch repr sent approximately 64 fee

Stat Plane Co dinate Projectio
Colorado Central Z ne
Datum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

IS Dept. 303-966-7707

P pa d by DynCorp

Prepared f KAISER HILL

June 27, 2002

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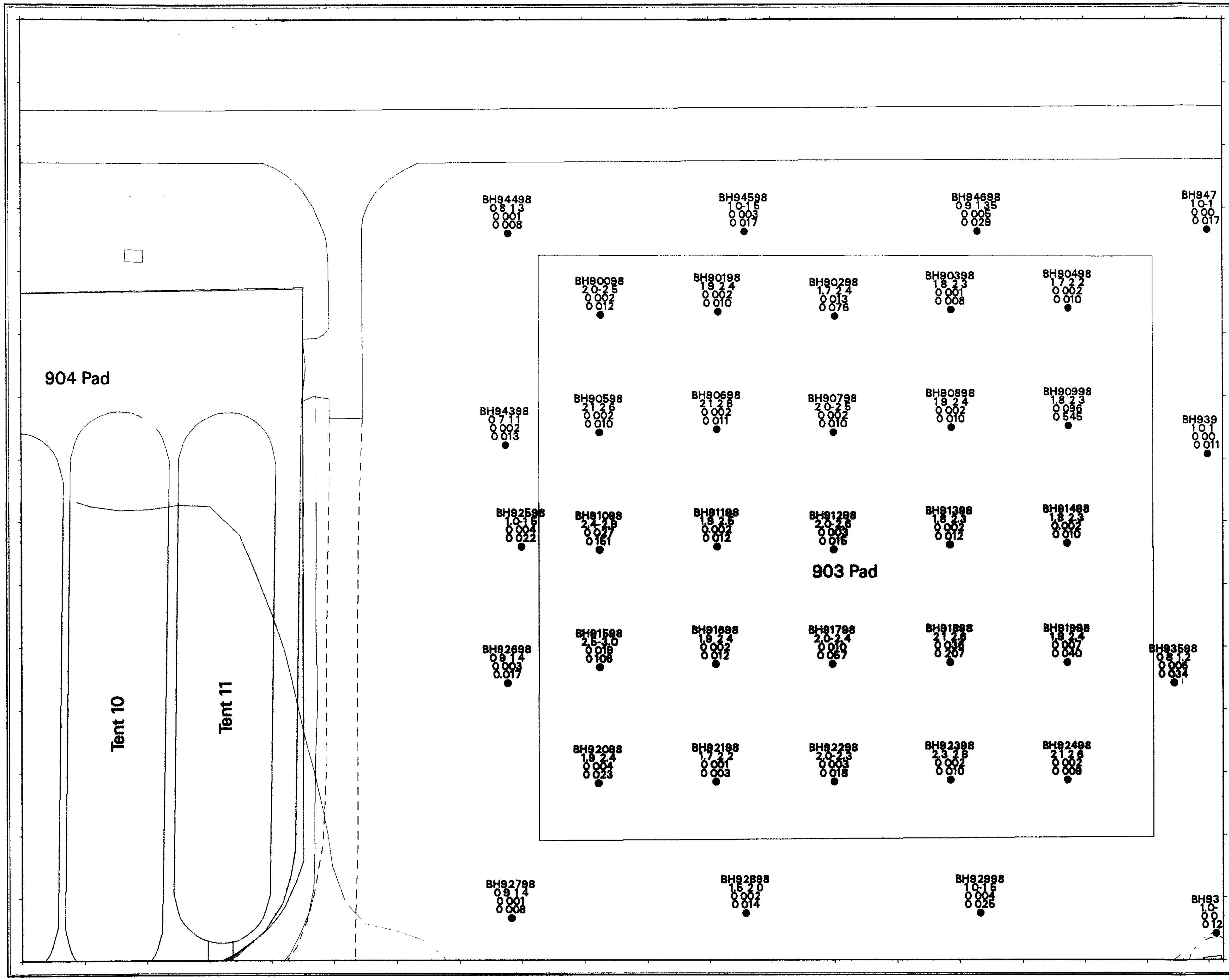

Figure 7

Native Soil Horizon 3

RFCA Tier I and Tier II Sum of Ratio Exceedances

EXPLANATION

Bo h l locati n

● Lo at
Sampl Depth (ft)
T I S m f Rat
T II S m f Rat

Exc d Tie I

E d T II

S_ d dM F

Buld g d h

Lak a d p d

S m d h th d ag f at

Fe d th b

Top g ph Co t (20 Fo)

Pav d ad

D rt ad

DATA SOURC BASE EATURES

DISCLAIMER

Scale 1 770
1 inch represent appr ximately 64 feet

0 40 80

Sta Plane Co rdinate Projec io
Colorad Central Z ne
D m NAD27

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June 27, 2002

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13

2085000 2085500 2086000 2086500 2087000 2087500

750000 749500 749000 748500 748000

154 153 155 111.8 111.7 111.6

IHSS 155

IHSS 140

109

Figure 9
IHSS Group 900 11 IHSS 112 Remediation Area

KEY

- IHSS 112 Remediation Area
- Nearby IHSSs
- PAC
- Stream ditch or other drainage
- Paved area
- Fence
- Dirt road

N

Scale - 1 2600

80 0 80 160 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum NAD 27

U S Department of Energy
Rocky Flats Environmental Technology Site

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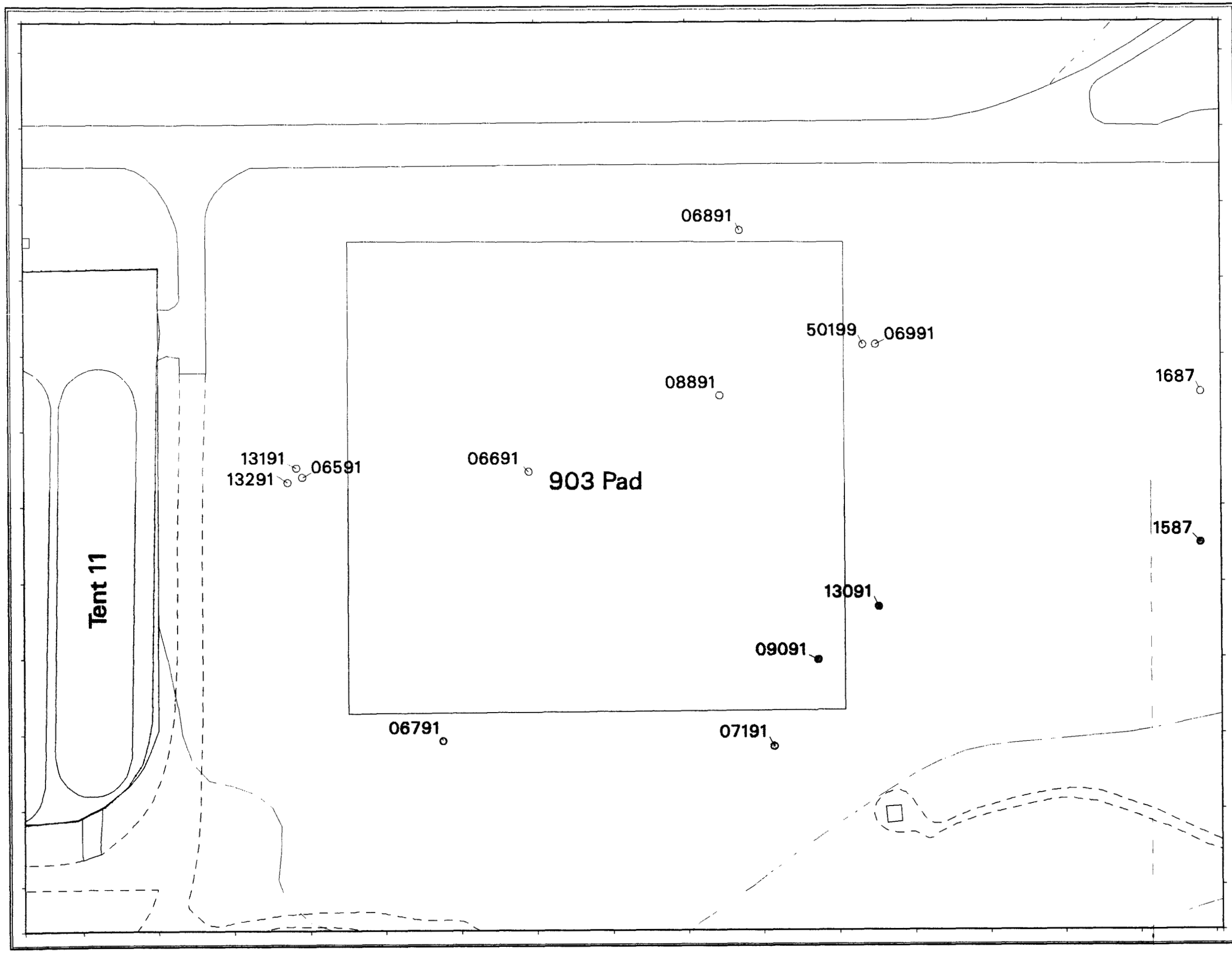
KAISER•HILL COMPANY

900-112 notification apr

Figure 10

903 Pad Area Wells



EXPLANATION

IMP Well R m ved

St ndard M p Feature

B ld g d th s ur

Fe d he b

T p g ph C (20 Fo)

Paved d

D d

DA SOURC BASE FEATURES

Sc l 1 930
1 h repr t app xmat ly 78 fe t

State Pl ne Co di st Pr jection
Colorad Ce t al Zo
Dat m NAD27

U S Department of Energy
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GIS Dept. 303-966-7707

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August 01, 2002

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